MANTRA

Making full use of Automation for National Transport and Road Authorities

1 Sep 2018 – 31 August 2020

Risto Kulmala

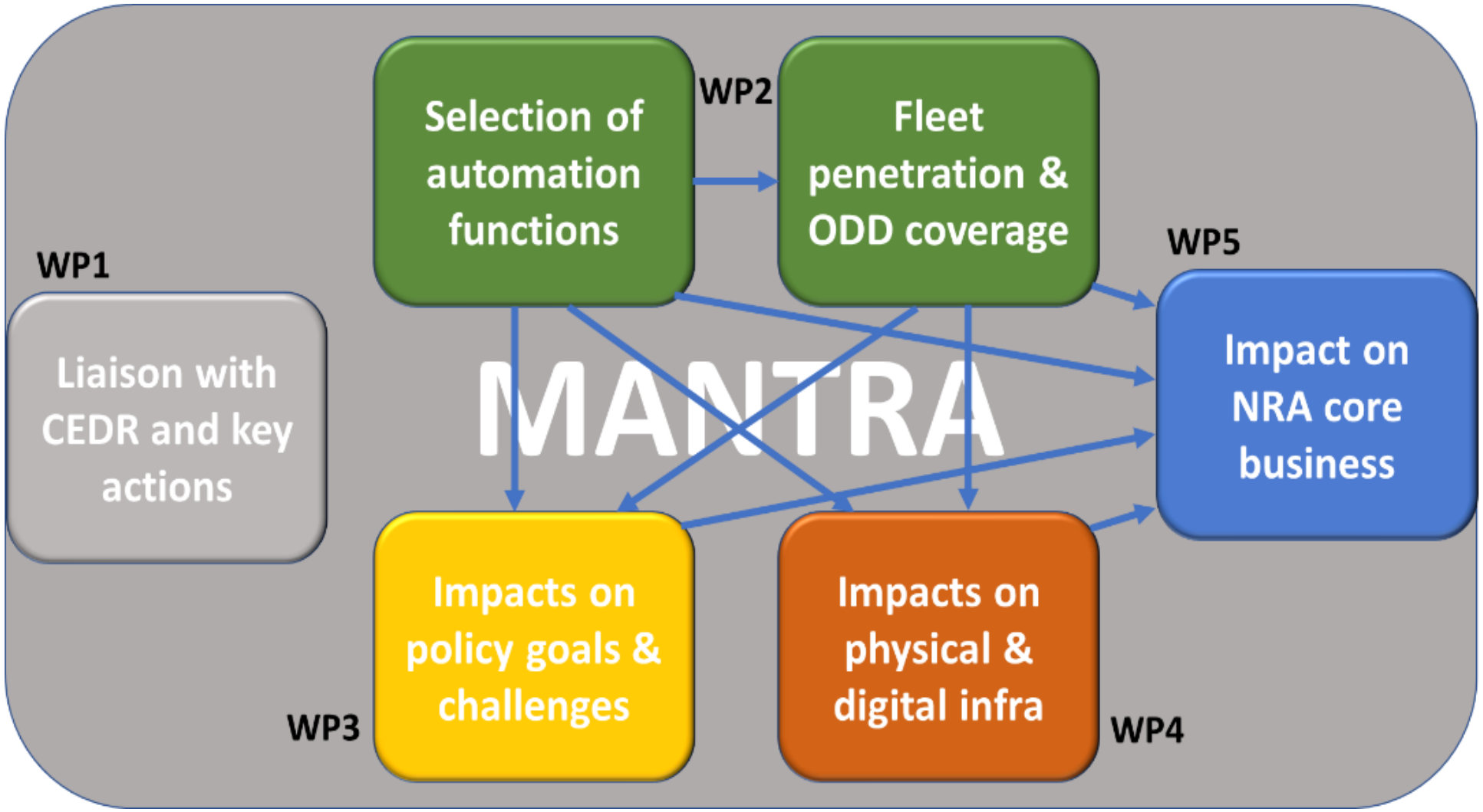
6 March 2019

risto.kulmala(at)traficon.fi

Objectives

- MANTRA responds to the questions posed in CEDR Automation Call 2017 Topic A: How will automation change the core business of NRA's
- Objective is to answer the following questions:
  - » What are the influences of automation on the core business in relation to road safety, traffic efficiency, the environment, customer service, maintenance and construction processes?
  - » How will the current core business on operations & services, planning & building and ICT change in the future?

Project structure & use cases



Use cases in analysis

- Highway autopilot/ chauffeur
- Highly automated (freight) vehicles on open roads including platooning
- Commercial driverless vehicles as taxi services
- Driverless maintenance and road works vehicles
  - Safety trailers
  - Winter maintenance vehicles

Impacts on policy targets

MANTRA: Making full use of Automation for National Transport and Road Authorities – NRA Core Business

Deliverable D3.2 – D3.2 Impacts of automation functions on NRA policy targets

Due date of deliverable: 31.12.2019

Actual submission date: 21.02.2020

Author(s) this deliverable:

Marieke van der Tuin, TU Delft, NL

Haneen Farah, TU Delft, NL

Gonçalo Homem de Almeida Correia, TU Delft, NL

Zia Wadud, University of Leeds, UK

Oliver Carsten, University of Leeds, UK

Michael Daly, University of Leeds, UK

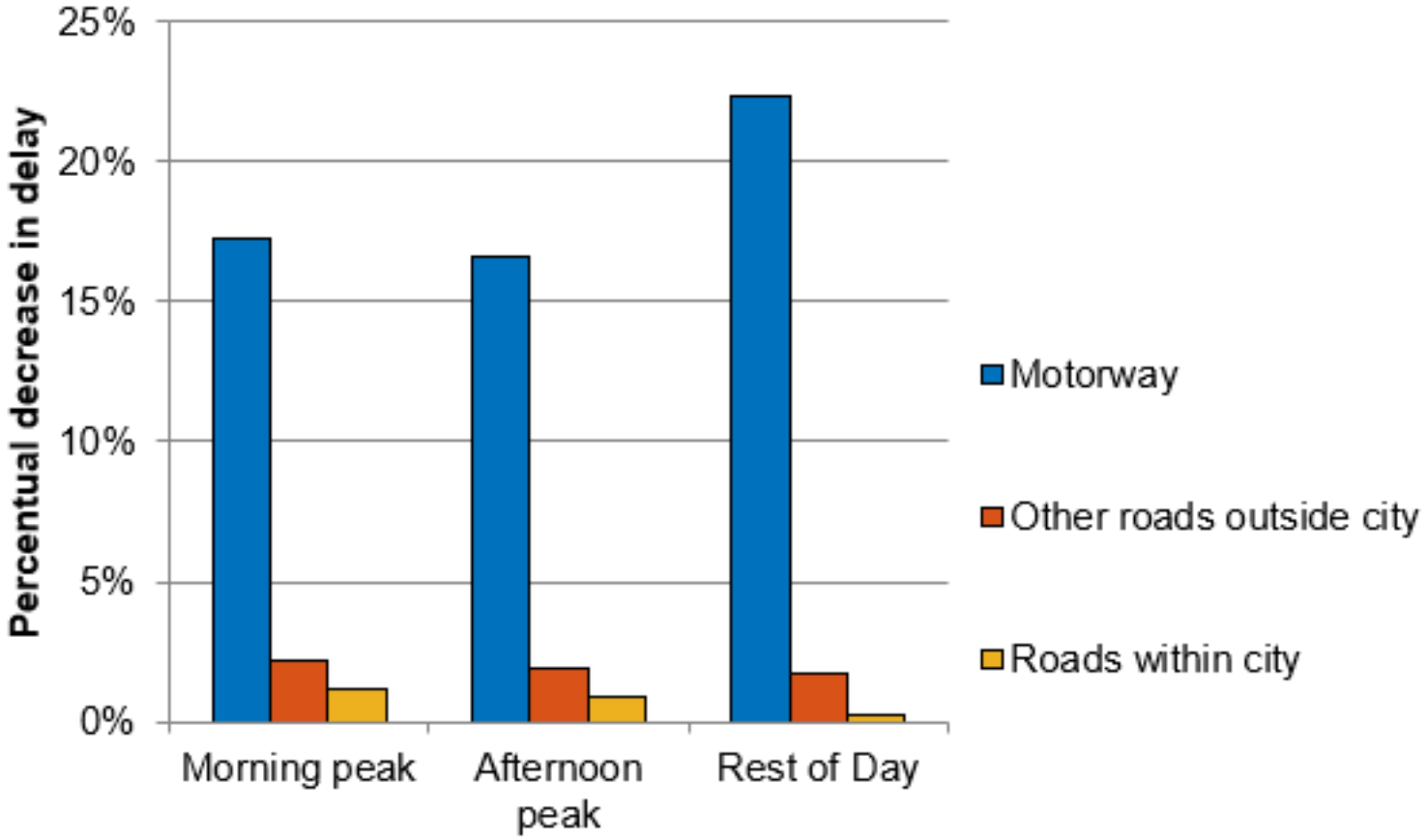
Sandra Ulrich, ARNDT IDC

Walter Aigner, HiTec

Impacts looked at and KPIs used

Impact area	Simulation tool	Assessed KPIs
Mobility and travel behaviour	Macro simulation	• Total kilometres travelled • Share of car and public transport • Delays (travelling reliability)
Energy and environment	Macro simulation	• Energy
Driver behaviour and traffic flow	Microsimulation	• Capacity • Travel time
Traffic safety	Microsimulation	• Number of conflicts

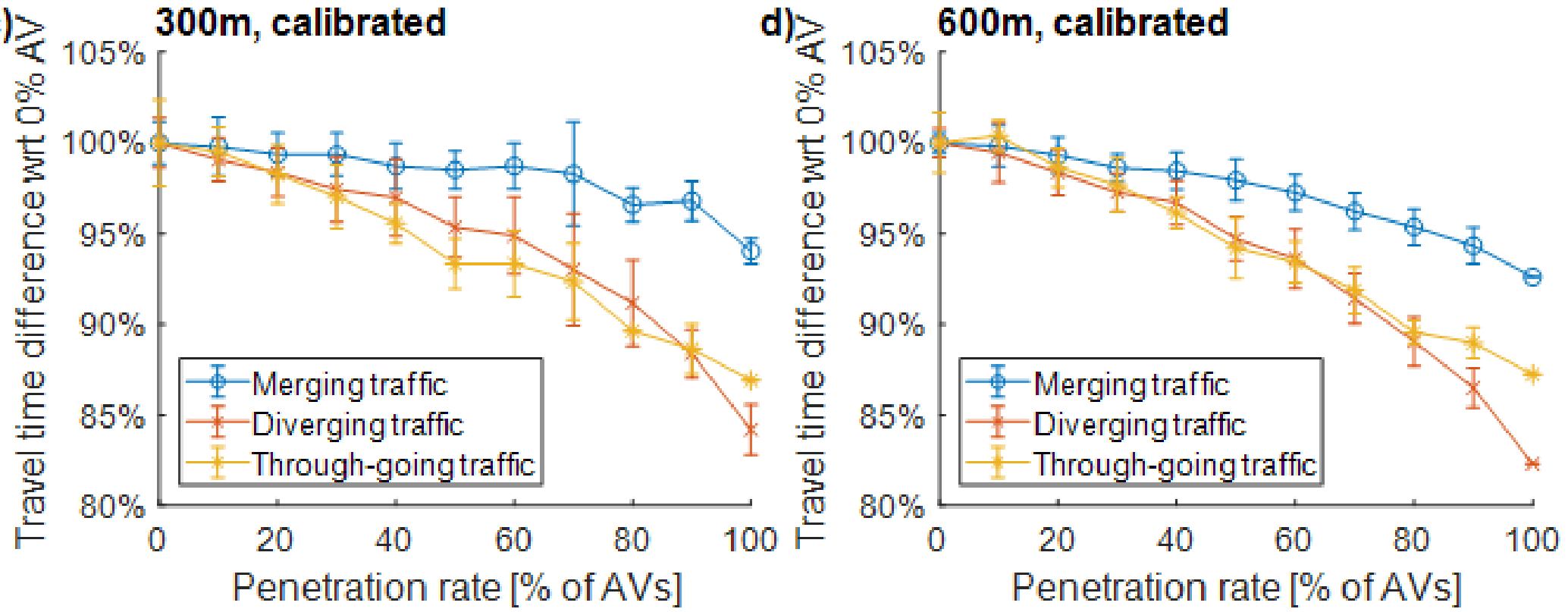
Selected results – highway autopilot and delays



Rotterdam area 2040

Figure 3.4 Decrease in average delays with 50% CAV, split per time period and road type

Selected results – highway autopilot and travel times



Weaving section with 0.55 flow/ capacity ratio

AV headway 0.6 s

Figure 3.8 Percentage of travel times w.r.t the 0% AV scenario for a weaving section with a 0.55 Flow/Capacity ratio, with a 300m (a/c) or 600m (b/d) taper lane and using the default (a/b) or calibrated (c/d) parameters for conventional vehicles

Selected results – highway autopilot and travel times

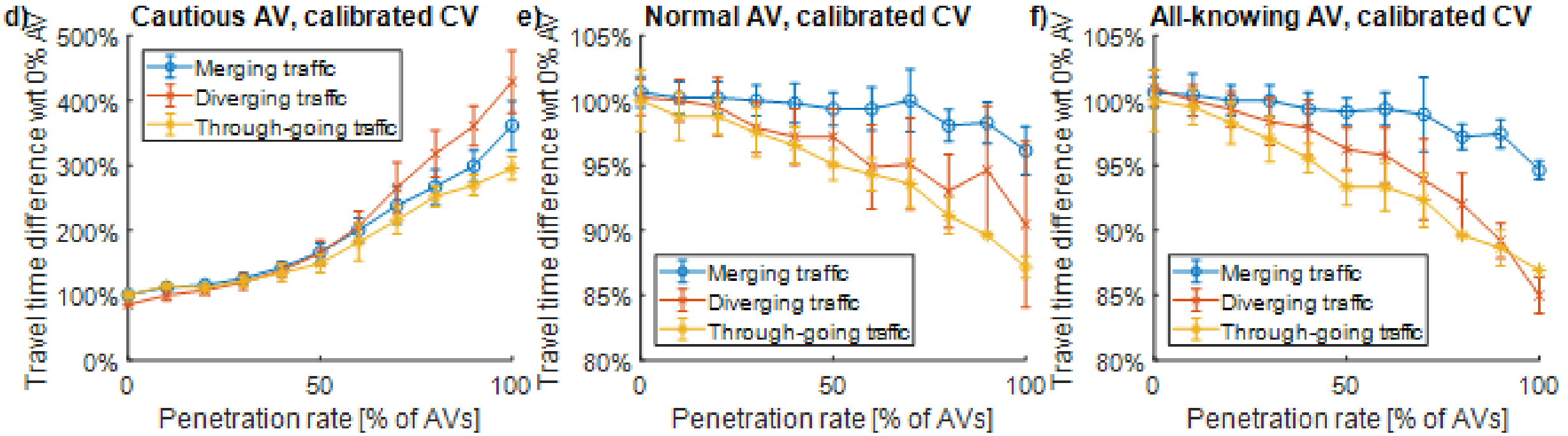
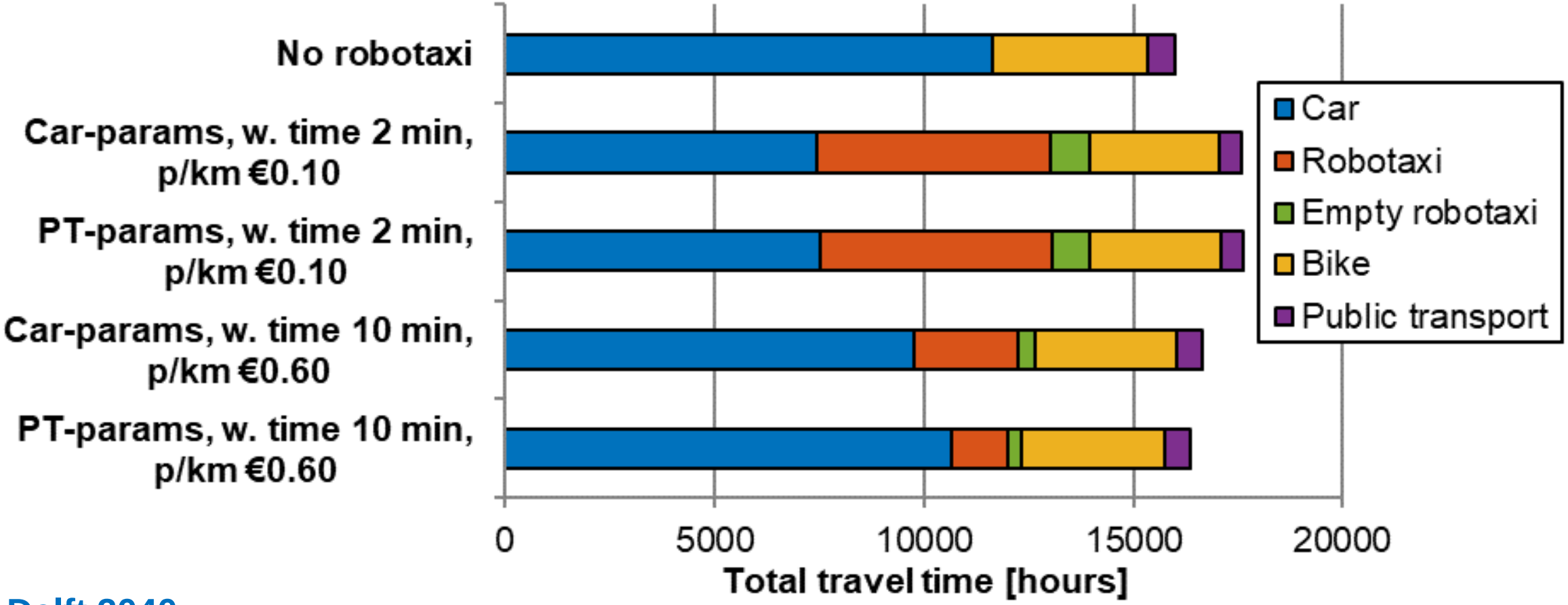


Figure 3.17 Comparison of different AV driving logics (cautious, normal, all-knowing) and different conventional vehicles (default, calibrated), modelled on a weaving section with a 300m taper lane and 0.85 flow/capacity ratio.

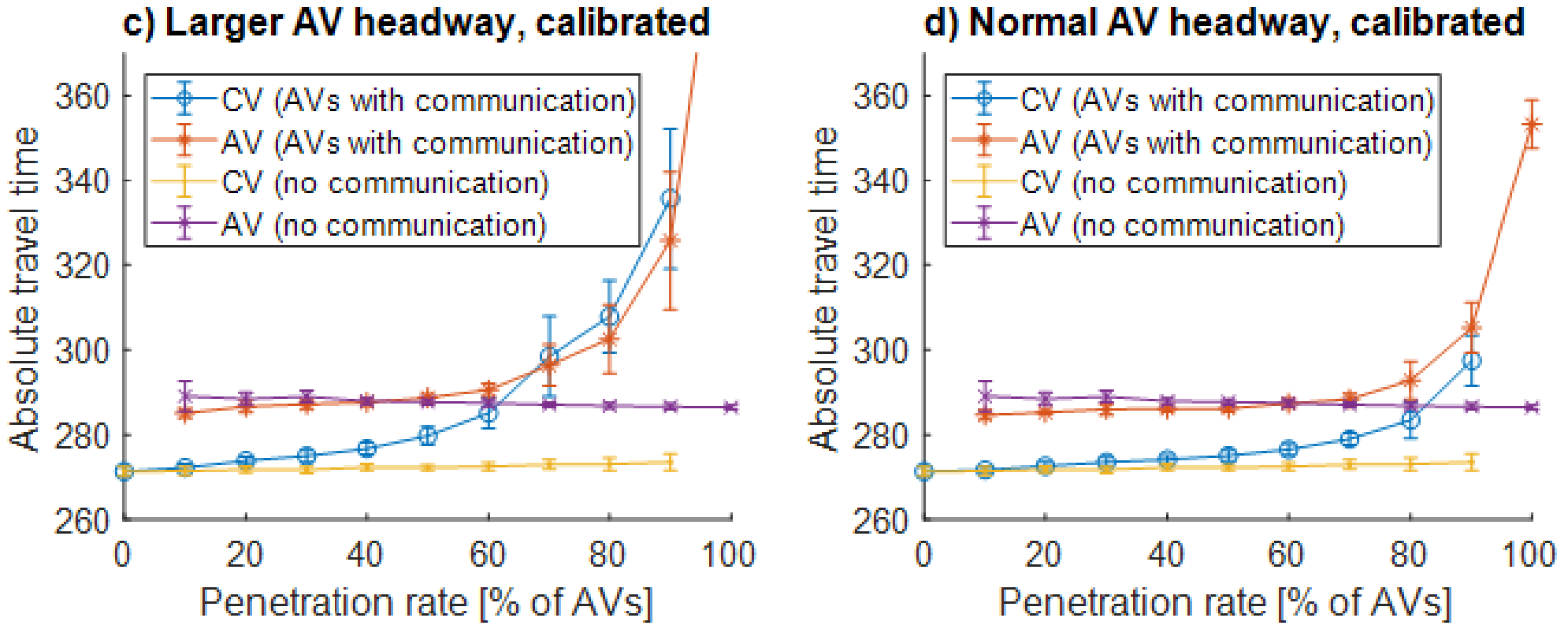
Headway for Avs: Cautious 1.5 s – Normal 1.0 s – All-knowing 0.6 s

Selected results – robot taxi and travel times



Delft 2040;
AV parametres either car or PT like, robot taxi km price 01 or 0.6 €/km, waiting time 2 or 10 min

Selected results – safety trailer and travel times

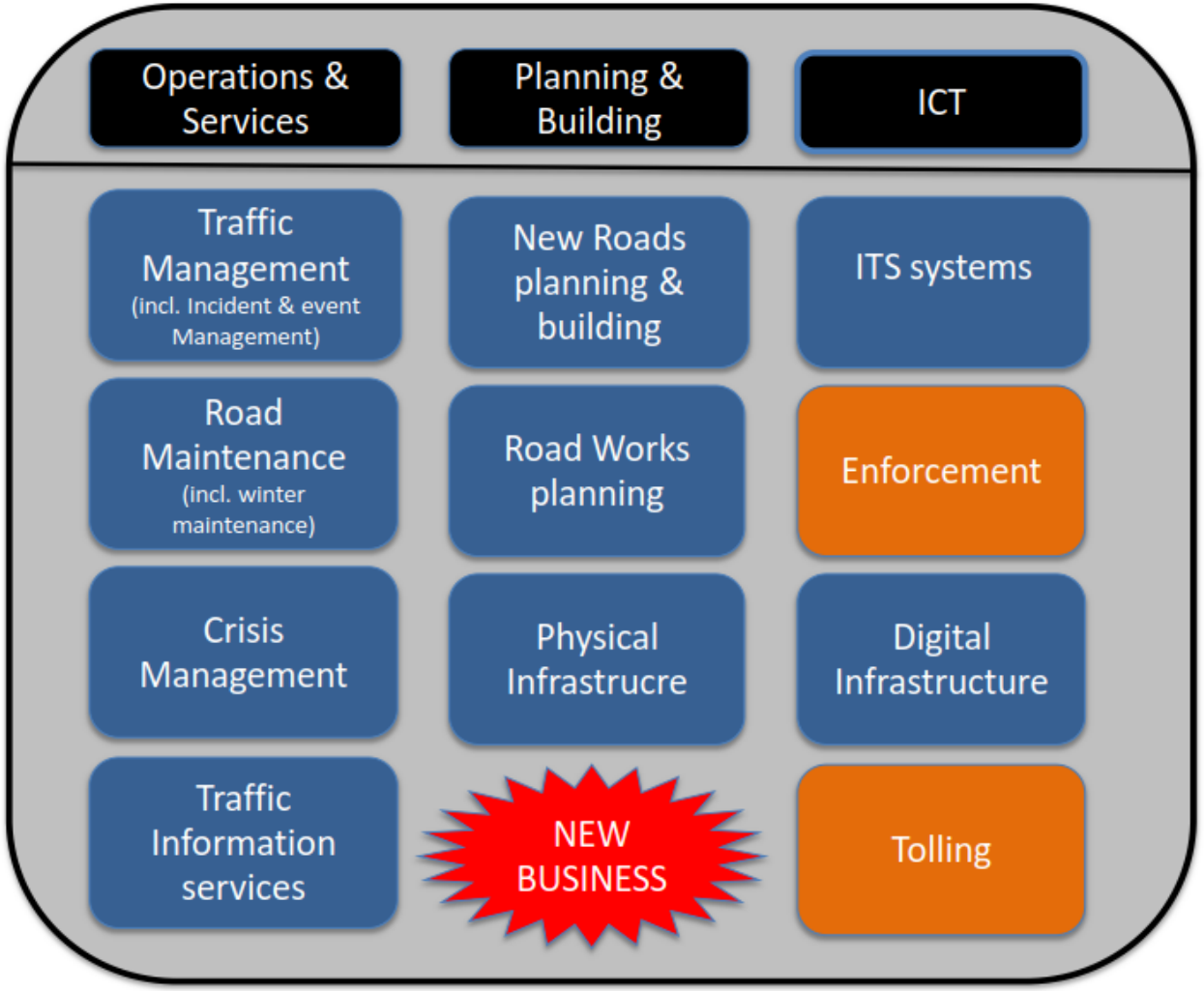


Either communi-cation to all or no vehicles at all!

Figure 6.6 Absolute travel times for the Safety trailer use case with a 0.56 f/c ratio, with CVs modelled using default (a,b) or calibrated (c,d) parameters and AVs adopting a larger headway (a,c) or normal headway strategy (b,d) while overtaking the maintenance work zone

Next steps

- Validation of infrastructure and policy impact results with CEDR
- Impacts on core business
- Development of road map and action plan for road authorities



Thank you for your attention

- MANTRA final deliverables
  - » D2.1 Vehicle fleet penetrations and ODD coverage of NRA-relevant automation functions up to 2040
  - » D3.1 Intermediate report of the state of the art on the impact of automated and connected vehicles
  - » D4.1 Intermediate Report on infrastructural consequences

  https://www.cedr.eu/strategic-plan-tasks/research/call-2017/call-2017-automation/
  - » Contains also results from two other projects of the same call
    - DIRIZON on road authorities and digitalisation
    - STAPLE on learning from automated driving test sites

- Own web site: www.mantra-research.eu (in progress)